BRITISH MICRO

Operating Guide to GRAFPAD

A Hegotron Group Company

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Contents

1.0 Introduction to the GRAFPAD

The GRAFPAD is a new and powerful graphics tool which allows you to draw and save complex pictures and diagrams without having to program any part of the work.

The GRAFPAD package includes a graphics tablet and pen, and a graphics program. The GRAFPAD tablet is used in the same way as a standard drawing pad. You use the pen to draw on the tablet, and as you draw, the picture is displayed on the screen. Any picture can be as roughly sketched or as precisely detailed as you wish. The graphics program gives you all your graphic facilities, any of which can be chosen simply by pressing a key on the keyboard.

You can include any or all of the ZX Spectrum colours in your pictures. You can draw freehand, draw standard geometric shapes, and build pictures from blocks of colour, from individually coloured pixels, or from a combination of both.

To help when drawing more complex designs, you can display a grid on screen, magnify parts of the screen, and invert or reverse the shapes you have drawn. You can also define window areas in pictures and create user-defined graphics; these can be stored and later incorporated in the more complex designs.

Unpacking the GRAFPAD kit, you will find:

* **This introductory booklet.**

* **The GRAFPAD drawing tablet.** This has a ribbon cable and connector which plugs into the Spectrum Edge Connector.
There is a removeable perspex cover which fits over and protects the drawing area on the tablet.

* **The GRAFPAD pen.** This has a cable and jack plug which plugs into the jack socket on the drawing tablet.

* **A cassette** containing the GRAFPAD graphics program.

* **A plastic GRAFPAD keyboard overlay.** This fits over the ZX Spectrum keyboard and labels each key with the graphics facility or facilities it provides.

2.0 Using the GRAFPAD Equipment

2.1 **The GRAFPAD tablet** is your means of writing and drawing on the screen. The grid drawn on the tablet contains 16 x 20 boxes, each box itself being a grid of 16 x 16 dots.

As you already know if you have used graphics on the ZX Spectrum, the PAPER area on screen also contains a grid of 704 character positions, each character position being made up of a square of 8 x 8 dots, or pixels (picture elements).

The dots on the GRAFPAD tablet correspond to the pixels on the screen. This means that one 16 x 16 square of dots on the GRAFPAD corresponds to 4 character positions on screen. To colour a character position you simply press the pen in the equivalent place on the GRAFPAD and press ENTER. As you move the pen on the GRAFPAD the cursor (the small cross on screen) moves around the screen to show exactly where the pen is.

You should always draw on top of the perspex cover, which protects the grid from damage. If required, you can draw through paper placed on top of the cover to transfer a drawing from paper to the computer. The GRAFPAD will read accurately through material of up to 3mm thickness with the cover on, and up to 7-8mm thickness without the cover. This material should be non-conductive. (Very heavy pencil is not advised, and could yield unpredictable results).

2.2 **The GRAFPAD pen** is made up of an aluminium shaft with a thicker black top. You should always:

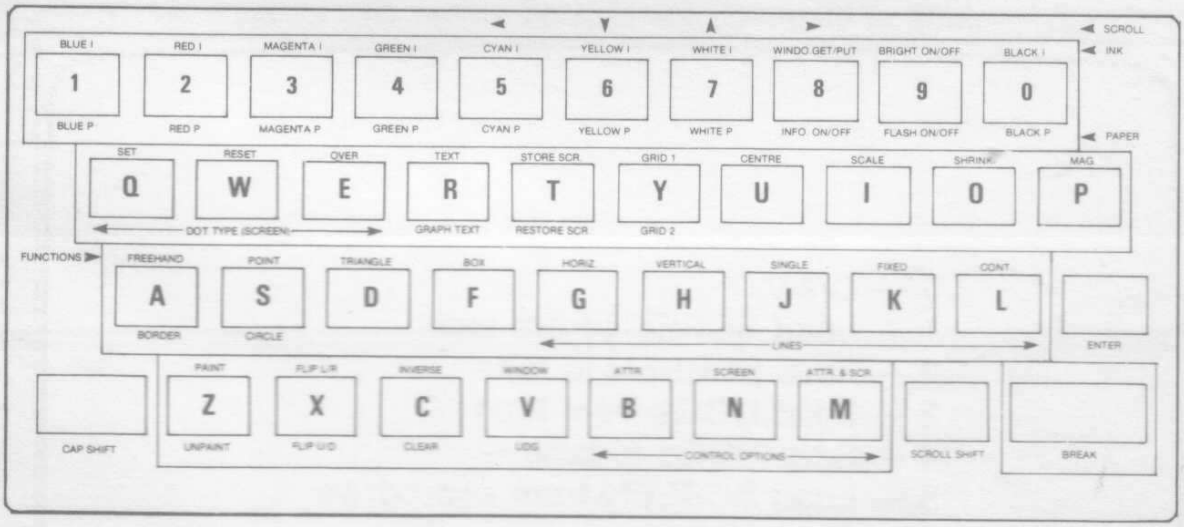
— Hold the pen by the lower aluminium shaft, which is earthed. If you hold the pen higher up, you can get inadequate contact between the pen and the tablet which can produce inaccurate results.

— Press gently on the nib so that the microswitch in the nib is pressed very lightly (you will hear a slight click as the pressure is registered). If you press too hard your point could be registered several times, and you will get lines appearing where not intended.
More seriously, continuous excess pressure damages the nib and will shorten the life of your pen.

2.3 **The GRAFPAD keyboard overlay** is a plastic cover which fits over the ZX Spectrum keyboard and labels each key with the drawing option or options it provides. Keys which can be used for one drawing option only, are labelled with the name of that option **OVER** the key. Keys which can be used for either of two drawing options are labelled with the name of one option **OVER** the key and the name of the other option **UNDER** the key.

To choose an option written over a key, just press the key. To choose one written under a key, press the CAPS SHIFT key at the same time as the appropriate key.

When you set up the GRAFPAD, place the keyboard overlay over the ZX Spectrum keyboard. The keyboard will now look like this:



All the options shown on the keyboard are drawing options. Before using any of them, first read Chapter 4 which explains how to draw pictures, summarises the function of each drawing option, and cross refers you to the section in Chapter 5 which deals with each function in detail.

3.0 Starting Up

Before connecting the GRAFPAD to the ZX Spectrum, make sure that the Spectrum is turned off.

Now:

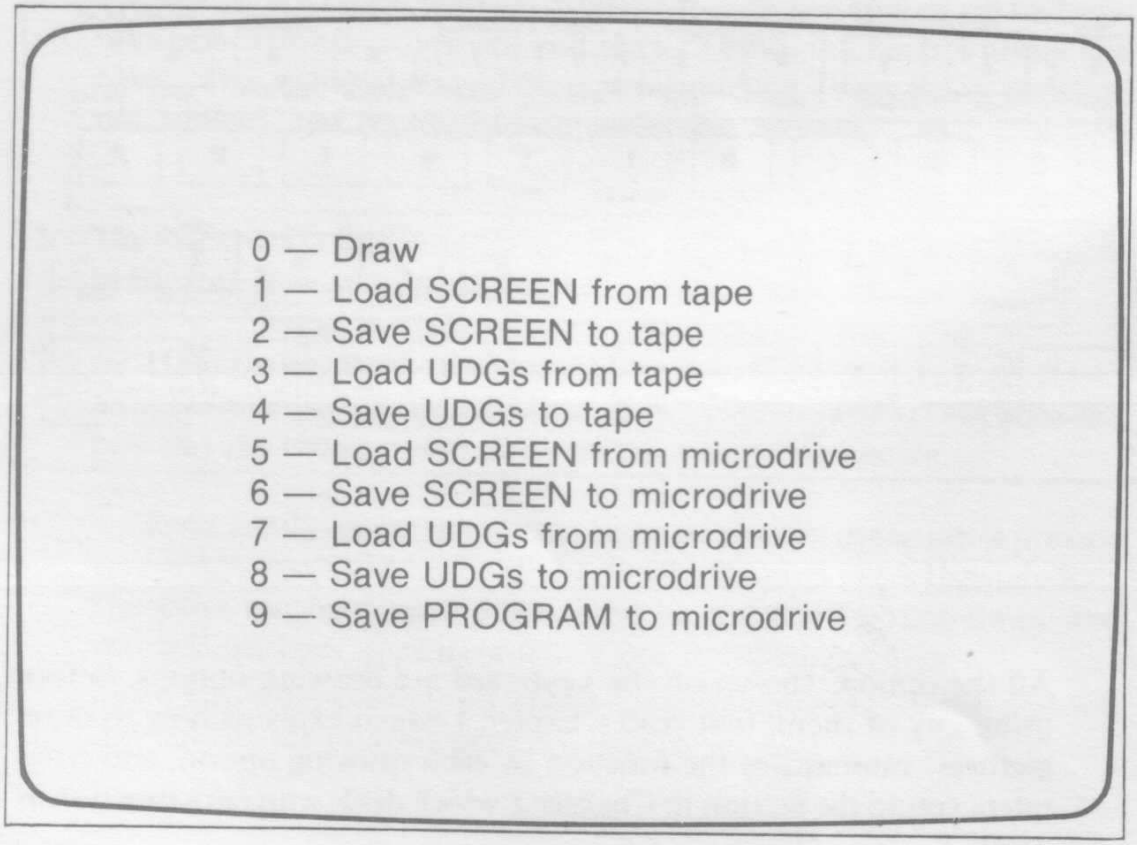
1. Connect the GRAFPAD by use of the cable supplied.
2. (Connect the cassette player) and switch the Spectrum on.
3. Type:

LOAD " " and press ENTER. Now start the cassette player.

(If you have copied the GRAFPAD program to microdrive, follow the load procedures in Chapter 6).

4. Place the plastic keyboard overlay over the ZX Spectrum keyboard.

When the GRAFPAD program is loaded, the first screen is a menu from which you choose one of the GRAFPAD options:



To choose an option you type the number displayed on the left of the option (there is no need to press ENTER).

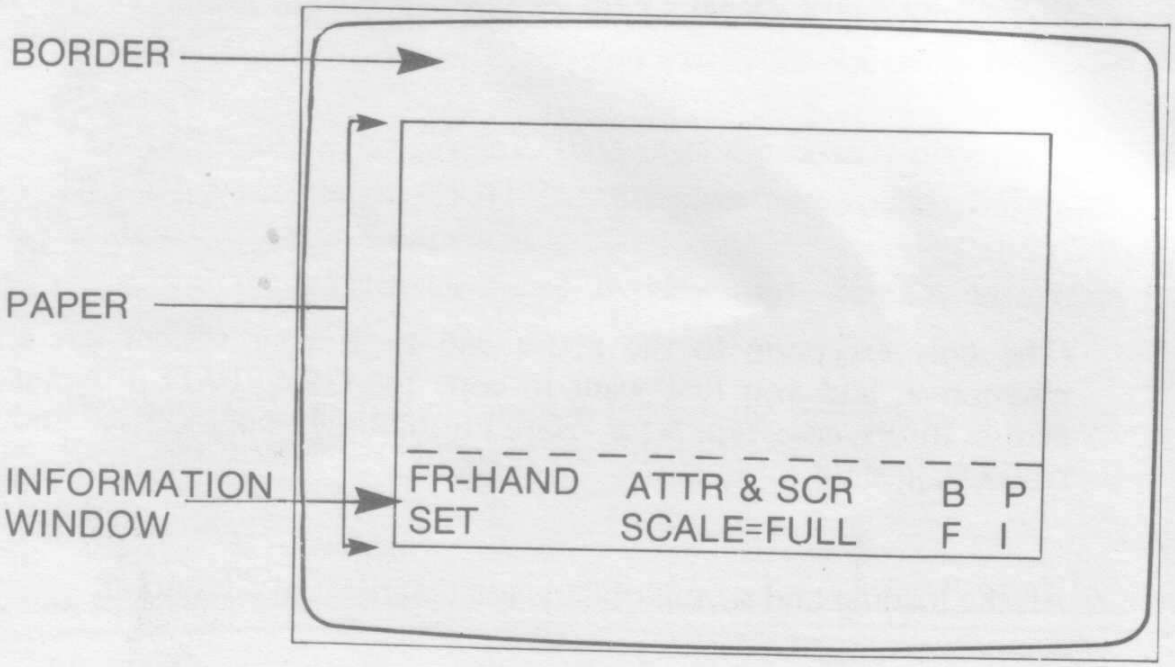
When you first start up you have no screens (pictures) or UDGs (user-defined graphics) to load or save. The first thing you will want to do is to draw a picture. So type 0 for "Draw", and go on to Chapter 4.

(The only exception to the above will be if your system has a microdrive, and you first want to copy the GRAFPAD program across. In this case, type 9 for "**Save PROGRAM to microdrive**" and read Chapter 6).

All the loading and saving options are described in Chapter 6.

4.0 Drawing pictures

Before drawing pictures, first make sure that you have placed the GRAFPAD keyboard overlay on your keyboard. Now choose option 0 — **"Draw"** from the first menu screen (shown in Chapter 3), and the drawing screen will be displayed:



Just like the normal ZX Spectrum screen, the GRAFPAD drawing screen is divided into two areas, the BORDER and the PAPER. As you see, at the bottom of the PAPER area there is an additional white band, the INFORMATION WINDOW. This window is described in section 4.1.

You can draw anywhere in the PAPER area, including where the INFORMATION WINDOW is displayed. As you move the pen on the GRAFPAD tablet, the "nib" of the pen is shown as the cursor (the small cross) on the screen. You press ENTER to "fix" where you want to draw the colour. The INFORMATION WINDOW will move out of your way when you touch it with the cursor. (If you find the window annoying, you can in fact remove it, and bring it back when you need to look at the information in it) (see section 5.6).

Again, like the normal ZX Spectrum screen, the dots you ink on the screen are coloured in the INK colour, the background colour being the PAPER colour. Because it corresponds to the nib of the pen, the cursor also takes the INK colour.

To start with, both INK and PAPER colours are black, so you will not be able to see the cursor when you place the pen on the GRAFPAD. So, before starting to draw, press CAPS SHIFT and C (clear). This makes sure that your paper is clear, and gives you white ink on black paper. Now press the pen onto the centre of the GRAFPAD, and the cursor will appear as a white cross on the screen.

You are now ready to draw. You do not have to choose the drawing options in any particular sequence, but in general:

1. Clear the screen (CAPS SHIFT + C) before starting a new drawing.
2. Check that the current options displayed in the INFORMATION WINDOW are the ones that you want (see section 4.1).
3. Choose any additional drawing options you want to use (see section 4.1).

Note: Always check that you have the correct control option (ATTRIBUTES, SCREEN or ATTR + SCR) before choosing a new drawing option.

4. Complete your picture, and save it on tape or microdrive, if required (see section 6.1).

4.1 The INFORMATION WINDOW

We have seen that the drawing options available are labelled on the GRAFPAD keyboard overlay, and that you choose an option written over a key by pressing the key, and you choose an option written under a key by pressing CAPS SHIFT at the same time as the relevant key.

Now look at your INFORMATION WINDOW. This window tells you the eight main options that you have currently chosen (there is not room in the window to cover all the possible options). To start with, these eight options are chosen for you and are summarised in the window below (the rest of the options are initially all set to OFF).

FR-HAND	ATTR & SCR	B	P
SET	SCALE=FULL	F	I

FR-HAND (freehand) is the drawing function (see section 5.4).

SET is the dot type (see section 5.3)

ATTR & SCR (attributes and screen) is the control option (see section 5.1).

SCALE=FULL is the viewing option (see section 5.10).

B (brightness), F (flash). P (paper colour), I (ink colour) are the attributes (see section 5.1).

When you change any of the above options, the new option is displayed in the information window.

Note: If, when you first display the drawing screen, the INFORMATION WINDOW does not look like the one above, you can correct it as follows:

If FR-HAND does not appear, press A.
If SET does not appear, press Q.
If ATTR & SCR does not appear, press M.
If SCALE=FULL does not appear, press I.
If B is in an extra bright square, press 9 for normal brightness.
If F is in a flashing square, press CAPS SHIFT and 9 for no flash.
If P is not in a black square, press CAPS SHIFT and 0
If I is not in a black square, press 7.

4.2 Summary of drawing options

The table below summarises all the GRAFPAD drawing options which are also described in detail in Chapter 5. In the table the options are listed in the order that they appear on the GRAFPAD keyboard overlay. In Chapter 5 they are grouped and described under functional headings.

GRAFPAD DRAWING OPTIONS

For drawing option:	Press ZX Spectrum keys:	Function	Section where described:
COLOURS	0-7 and CAPS + 0-7	Give colour, brightness and flash attributes to the INK and PAPER	**5.2**
BRIGHTNESS	9		
FLASH	CAPS + 9		
WINDOW GET/PUT	8	Stores a window/restores a window to the screen	**5.5**
INFO	CAPS + 8	Removes/replaces the INFORMATION WINDOW	**5.6**
SET	Q	Determine whether SET/RESET pixels will take the INK or PAPER colour	**5.3**
RESET	W		
OVER	E		
TEXT	R	Allows you to include standard keyboard characters as text in your picture	**5.7**
GRA-TEXT	CAPS + R	Allows you to include UDGs (User-defined graphics) in a picture	**5.7**
STORE SCR	T	Stores/restores a picture to screen from temporary store	**5.8**
RESTORE SCR	CAPS + T		
GRID 1	Y	Shades a dark/light grid over the picture. Grid 2 also colours all set pixels magenta, and all reset pixels white.	**5.9**
GRID 2	CAPS + Y		

For drawing option:	Press ZX Spectrum keys:	Function	Section where described:
CENTRE	U	Centres a magnified part of a picture around the current cursor position	**5.10**
SCALE	I	Allows/inhibits a magnified picture to move with the cursor around the screen	**5.10**
SHRINK	O	Reduces a magnified picture back to its normal size	**5.10**
MAG	P	Magnifies part of a picture by a factor of 8 for up to three times	**5.10**
FREEHAND	A	Allows freehand drawing	**5.4**
BORDER	CAPS + A	Allows change of border colour	**5.2**
POINT	S	Allows you to colour individual pixels	**5.4**
CIRCLE	CAPS + S	Draws a perfect circle	**5.4**
TRI	D	Draws a triangle	**5.4**
BOX	F	Draws a square or rectangle	**5.4**
HORIZ	G	Horizontal line	**5.4**
VERTICAL	H	Vertical line	**5.4**
SINGLE	J	Diagonal line	**5.4**
FIXED	K	Lines are fixed at start point	**5.4**
CONT	L	Continuous line	**5.4**
ENTER	ENTER	"Fixes" the cursor position on screen — used mainly to show where drawing/painting is to start. In response to a prompt this is used as a standard general ENTER key	**5.4/ 5.11**
CAPS SHIFT	CAPS SHIFT	Chooses the drawing option written under a key	
PAINT	Z	Fills an area of RESET pixels with colour	**5.11**
UNPAINT	CAPS + Z	Fills an area of SET pixels with colour	**5.11**

For drawing option:	Press ZX Spectrum keys:	Function	Section where described:
FLIP LR	X	Turns SCREEN and ATTRIBUTES from left to right	**5.12**
FLIP UD	CAPS + X	Turns SCREEN and ATTRIBUTES upside down	**5.12**
INVERSE	C	Reverses all pixels (SET becomes RESET, RESET becomes SET) and reverses ATTRIBUTES (INK colour becomes PAPER colour, PAPER colour becomes INK colour)	**5.12**
CLEAR	CAPS + C	Resets all pixels (any picture is lost). Changes all squares to current colour	**5.12**
WINDOW	V	Enters/exits window mode. Allows you to define a window area in your display	**5.5**
UDG	CAPS + V	Stores user-defined graphics	**5.7**
ATTR	B	Selects ATTRIBUTES only (Colours, brightness, flashing)	**5.1**
SCREEN	N	Selects SCREEN only (pixels)	**5.1**
ATTR & SCR	M	Selects ATTRIBUTES and SCREEN	**5.1**
SCROLL SHIFT + ARROW	SYMBOL SHIFT + CURSOR ARROW KEYS	Scrolls the screen in the direction of the arrow	**5.13**
BREAK	BREAK SPACE	Exits from a drawing option. (If the option is TEXT, this is a SPACE key)	

5.0 Drawing options

5.1 Control Options (SCREEN, ATTRIBUTES, ATTR & SCR)

The current control option determines what is available to you on the display, i.e. Whether you are working with only the screen, or with attributes only, or with both attributes and screen. The control option you have chosen is written in the top centre of the INFORMATION WINDOW, and to start with is set at ATTR & SCR (attributes and screen).

Make sure that you understand how the control options work. This is important, because although (with three exceptions) you can choose any of the drawing options while using any control option, the way in which a drawing option works will often be different for different control options. (The three exceptions are PAINT, UNPAINT and TEXT.) These drawing options only affect the screen.

After reading through this chapter, practice using some of the drawing options with different control options. When you can always predict what is going to happen, you have understood how the control options work!

If you have already used graphics on the ZX Spectrum you will know that the display is divided into two parts:

The SCREEN
The ATTRIBUTES

The SCREEN is the grid of 24 x 32 character positions which makes up your PAPER area. Each character position itself is a square of 8 x 8 pixels (picture elements). To plot a pixel you press the pen on the GRAFPAD at the relevant point and press ENTER. Each pixel can be SET or RESET (see section 5.3).

When SET the pixel shows in the INK colour.
When RESET the pixel shows in the PAPER colour.

The ATTRIBUTES supply for each character position (square of 8 x 8 pixels):

The INK colour to the SET pixels.
The PAPER colour to the RESET pixels.
The BRIGHTNESS (high or low).
The FLASH setting (on or off).

To supply attributes to a character position you press the pen on the GRAFPAD at the relevant character position and press ENTER.

Normally when you draw pictures you will work with both screen and attributes (the ATTR & SCR control option). With ATTR & SCR you can SET and RESET pixels, and everything you draw is affected by the current attributes, i.e., as you SET pixels they take the current ink colour, and the RESET pixels in the relevant square take the current paper colour. The brightness and flash of the square will also take the current settings.

However, you can choose to work exclusively with the screen or attributes:

The SCREEN control option means that you only work with pixels, unaffected by the current attributes. When you set/reset pixels they will continue to take the original ink/paper colours.

The ATTRIBUTE control option means that you only work with attributes. You cannot set/reset pixels — you can only supply ink and paper colours to squares, add or reduce the brightness, make the square flash or make it steady.

Note: When you move from control option to control option nothing changes on screen until you start drawing. For example, you can SET pixels in SCREEN mode then move to ATTRIBUTE mode and change the ink colour. But the SET pixels will not take the new ink colour until you draw in the relevant character position.

5.2 Colours (INK, PAPER, BRIGHTNESS, FLASH, BORDER)

You can use all eight ZX Spectrum colours in your drawings. They are given the numbers 0 to 7 on the GRAFPAD keyboard overlay, in the same way as the standard keyboard.

But, of course, with the GRAFPAD you do not have to enter a command to choose a colour, you simply press the relevant key. Here is a list of the colours for reference:

0 black
1 blue
2 red
3 magenta (purple)
4 green
5 cyan (pale blue)
6 yellow
7 white

INK AND PAPER

The INK colours are written **over** the keys, so you choose an ink colour simply by pressing one of the keys 0 to 7.

The PAPER colours are written **under** the keys, so you choose a paper colour by pressing CAPS SHIFT together with one of the keys 0 to 7.

The current PAPER and INK colours you have chosen are shaded over P (paper) and I (ink) on the righthand side of the INFORMATION WINDOW. For example, if your paper is black and your ink white, the P will be in a black square, and the I in a white square. Remember, however, that the colours are ATTRIBUTES. This means that you will not actually see your current colours as you draw on the screen unless your control option is ATTRIBUTES or ATTR & SCR. (If your control option is SCREEN, you will see whatever the original ink and paper colours were).

BRIGHTNESS AND FLASH

As we saw in section 5.1, there are two ATTRIBUTES in addition to colours — these are BRIGHTNESS and FLASH. Each attribute square is given a brightness (normal or extra bright), and will flash or not flash, depending on the current BRIGHTNESS and FLASH settings. (The flashing is done by swapping the ink and paper colours).

The current BRIGHTNESS and FLASH options are shown by the B (brightness) and F (flash) on the righthand side of the INFORMATION WINDOW. If brightness is ON, the B is in an extra bright square; otherwise the squares are normal.

BRIGHTNESS and FLASH are given the number 9.

To turn BRIGHTNESS on:

Press 9

To turn BRIGHTNESS off:

Press 9 (again).

To turn FLASH on:

Press CAPS SHIFT and 9

To turn FLASH off:

Press CAPS SHIFT and 9 (again).

Remember: BRIGHTNESS and FLASH are ATTRIBUTES; you will only see the effect of the current options when the control option is ATTRIBUTES or ATTR & SCR.

BORDER

The border is the outer coloured area of the screen which frames your picture. A border does not form part of a picture, (i.e. when you save a picture the border is not saved), but you can change the border colour to contrast with your picture when it is displayed on screen. The chosen control option does not matter when changing the border colour.

BORDER is written **under** the letter A, so to change the colour:

Press CAPS SHIFT and A
The prompt: BORDER (0-7)??? appears
Press one of the colours 0-7
Press ENTER.

The border colour changes and the prompt disappears.

(If you choose the BORDER function by mistake, press BREAK to remove the prompt).

5.3 Dot/pixel types (SET, RESET, OVER)

The dot type determines whether a pixel will be SET or RESET (i.e. take the INK or PAPER colour) when you use any of the line or freehand options in SCREEN or ATTR & SCR mode. (In ATTRIBUTE mode these options have no effect).

If you choose SET, pixels will show in the INK colour.
If you choose RESET, pixels will show in the PAPER colour.
If you choose OVER, pixels will be reversed, i.e. SET pixels will become RESET, and RESET pixels will become SET.

The dot types are written over the keys Q, W, or E, so to choose the required dot type, simply press one of the keys Q, W, or E. Your current dot type option is displayed in the bottom left of the INFORMATION WINDOW.

5.4 Drawing functions (FREEHAND, POINT, CIRCLE, TRI, BOX, HORIZ, VERTICAL, SINGLE, FIXED, CONT)

The drawing function determines what shape you are going to draw, your current choice of function being displayed in the top lefthand side of the INFORMATION WINDOW.

To choose a drawing function, press one of the following keys:

Function:	Key:
FREEHAND	**A**
POINT	**S**
Geometric shapes:	**CAPS** and **S — Circle**
	D — TRIANGLE
	F — BOX (square/rectangle)
	G — HORIZONTAL LINE
	H — VERTICAL LINE
	J — SINGLE LINE (diagonal)
	K — FIXED LINE
	L — CONTINUOUS LINE

To draw **FREEHAND,** place the cursor at your chosen starting position and press ENTER. A freehand line will now be drawn as you move the pen. To finish the line, either lift the pen from the GRAFPAD tablet, or press BREAK. (Pressing BREAK gives you a more precise finish to the line). Press ENTER to start again.

The **POINT** function allows you to INK idividual pixels at the cursor position, and is very useful when drawing fine detail. Place the cursor at the required point and press ENTER.

To draw a **geometric shape,** first fix the ORIGIN of the line or shape by position and pressing ENTER. Now move the PEN — you will see an "elastic" line or shape being drawn with the cursor from the ORIGIN.

When you have moved the line or shape to the required position, press ENTER again to "fix" the line or shape. (You can cancel an incomplete line or shape by pressing BREAK before pressing ENTER). In this case the shape disappears, and you must start again by re-establishing an ORIGIN.

With the following options:

> BOX, HORIZONTAL LINE, VERTICAL LINE and SINGLE LINE, the second press of the ENTER key completes the box or line. You can now choose a different option, or draw another box or line of the same type by fixing another ORIGIN.

With CIRCLE, the first time you press ENTER this fixes the centre; the second ENTER fixes the radius. The circle is now drawn automatically.

With TRIANGLE, the first ENTER fixes one corner, and the second ENTER fixes the second corner. Two "elastic" lines are now drawn with the cursor from both corners, and you press ENTER (a third time) to fix the triangle.

With FIXED LINE, each time you press ENTER another line is drawn from ORIGIN to the cursor position (like rays from the sun). To complete the shape, press BREAK.

With CONTINUOUS LINE, each time you press ENTER, the ORIGIN is moved to the end of the last line. To complete the shape you press BREAK.

5.5 Window functions (WINDOW, WINDOW GET, WINDOW PUT)

The window function allows you to create a window within the display area. You can then draw in the window, store it, and call it back to place it anywhere on the screen. Windows are very useful where you want to repeat a shape several times in a picture. For example, you could create a forest of trees by drawing one tree, storing it as a window, then repeatedly placing it back on the screen.

To **define a WINDOW:**

Press V

You are now in window mode, and a flashing prompt WINDOW is displayed to confirm this. Now position the cursor where you want to fix one corner of the window, and

Press ENTER

This fixes the first corner. Now move the pen diagonally to the opposite corner. As the cursor moves, it will "trail" a box which shows the location of the window. To fix the other corner of the window:

Press ENTER

The flashing WINDOW prompt disappears and you have defined the window area. The box showing the outline of the window now disappears, and **no** functions work outside the window area. If the pen is outside the window, the cursor will not appear, so it is easy to lose the window. If you do lose the window, the easiest way to find it is to magnify the screen and switch the SCALE to DISPLAY (see section 5.10).

To **exit window Mode:**

Press V (again)

To **store a WINDOW:**

stay in window Mode, and choose
WINDOW GET, i.e.,
Press 8 while in window Mode.

Note: Only one window can be stored at one time.

To **restore a WINDOW:**

Press 8 while NOT in window Mode.

Now place the pen on the GRAFPAD. You will see a box around the cursor. Position the box where you want the window to appear.

Press ENTER

This will put the stored window in the box.

5.6 Information window (INFO ON, INFO OFF)

To remove the INFORMATION WINDOW from the PAPER area:

Press CAPS SHIFT and 8

To restore the INFORMATION WINDOW:

Press CAPS SHIFT and 8 (again)

Restoring the INFORMATION WINDOW does not cause anything you have drawn in this part of the display to be lost.

5.7 Text and user-defined graphics (TEXT, GRAPHICS TEXT, UDGs)

The text and user-defined graphic options allow you to add text to a picture, as well as to define your own graphic characters and include them in a picture. A graphic character is called a user-defined graphic or UDG, and is an 8 x 8 pixel square in which you have defined a character or shape. When placing ("fixing") a UDG in a picture, the cursor takes the shape of the UDG.

To **use the TEXT option:**

Press R

Now place the cursor where you want the text to start and

Press ENTER

You are now in text mode. The screen loses colour (i.e. reverts to black and white), and you can now use the normal keyboard to include your text in your picture. When the text is complete:

Press ENTER

This takes you out of text mode.

Note: In text mode you can erase text before pressing ENTER. To do this:

Press CAPS SHIFT and BREAK.

The text is erased and you return to the original picture.

To **save a graphic character in a UDG:**
(you can save up to 23 UDGs, labelled a-u).

Press CAPS SHIFT and V

This puts you into UDG mode. Now position the cursor where you have drawn the graphic character.

Press ENTER

The prompt **SAVE IN a-u?** is displayed. This is asking you for the particular UDG in which you want to save the graphic character.

Type a letter in the range a-u

Press ENTER

this saves the UDG. (Any UDG already assigned to the letter you entered will be replaced by the new UDG).

To **leave UDG mode:**

Press CAPS SHIFT and BREAK

To **use graphic text (a UDG) in a picture:**

Press CAPS SHIFT and R

This puts you into graphic text mode, and you are prompted to name the UDG you require.

Type a letter in the range a-u.

The cursor now takes the shape of the UDG. To "fix" the UDG in your picture, position it where required, and

Press ENTER

You can fix the same UDG in as many places as you wish, by repeatedly pressing ENTER.

To **leave graphic text mode:**

Press CAPS SHIFT and BREAK

5.8 Temporary storage (STORE SCR, RESTORE SCR)

You can have up to two pictures in temporary store at any one time. This option allows you to keep readily available "master copies" of pictures which you are altering or painting, and is extremely useful should you make mistakes.

To store the picture on the screen:

Press T

This puts you in temporary storage mode. The prompt: **SAVE IN 0 or 1?** is displayed.

Type either 0 or 1

Press ENTER

This saves the picture in temporary store 0 or 1. (Any picture already in the store you chose, is replaced by the new picture).

To leave temporary storage mode:

Press BREAK

To restore a picture in either of the temporary stores:

Press CAPS SHIFT and T

You are now prompted to identify which store.

Type either 0 or 1

The picture in the store you specified is displayed on the screen.

5.9 Grids (GRID 1, GRID 2)

You can display either of two grids on screen. Both grids are made up of alternate light/dark squares which are the same size as the attribute squares (the original brightness of the squares in your picture are ignored). These grids are drawing aids only and do not form part of your final picture.

GRID 1 only affects the brightness of your picture. GRID 2 in addition, ignores the original colours of the picture, and shows all SET pixels in magenta and all RESET pixels in white.

To display GRID 1, press Y, and to remove it, press Y again.

To display GRID 2, press CAPS SHIFT and Y, and to remove it, press CAPS SHIFT and Y again.

Note: When using GRID 2, you cannot see the actual colours in your picture, but you can still change them. This can result in some unexpected surprises when you remove the grid.

5.10 Magnification (CENTRE, SCALE, SHRINK, MAG)

The magnification options are:

Press P to MAGNIFY the present section of the picture (the section centred round the cursor) by a factor of 8. You can do this up to three times.

Press O to SHRINK the present section of a magnified picture back to its standard size.

Press I to switch the SCALE between FULL and DISPLAY. With SCALE=FULL the sections of a magnified picture that are displayed will keep changing so as to always show the cursor. Press I again to get SCALE=DISPLAY. With SCALE= DISPLAY only one section of a magnified picture is displayed at once. To move to another section you must shrink the picture first.

Press U to Centre a magnified section of a display round the current cursor position.

5.11 Painting Functions (PAINT, UNPAINT)

You can colour areas of your picture by using the PAINT function. When you use this function it is like pouring paint on your picture with lines of SET pixels acting as walls to limit the extent of the paint. The paint acts on the RESET pixels. For example, use the BOX function to draw a box, select PAINT and now when you place the cursor within the box and press ENTER, the box will fill with colour, but nothing else will be painted. The paint colour will be the original ink colour. The control options have no effect on the PAINT function as it uses only the screen.

When using the PAINT function you must be very careful that the line enclosing the area you want to paint does not have any holes in it. If it does the paint will "leak out" and colour the whole picture. When you draw lines with the dot type set to OVER it is often possible to leave small holes by mistake, so you should always check for holes in the line enclosing an area you want to paint, before you use the PAINT function.

The UNPAINT function works in a similar way to the PAINT function, with the RESET pixels acting as the walls of the area and the colour of all SET pixels reverting to the original paper colour. Again, the control options have no effect on the UNPAINT function as it uses only the screen.

To choose the PAINT function:

Press Z

You now position the cursor where you want the paint to start. This must be over a RESET pixel.

Press ENTER

The screen will now go dark for a second and reappear with the area surrounded by the SET pixels filled by the paint colour. This is the original ink colour. To leave PAINT mode you

Press CAPS SHIFT and BREAK

To choose the UNPAINT function:

Press CAPS SHIFT and Z

You now position the cursor where you want to UNPAINT. This must be over a SET pixel.

Press ENTER

The screen will now go dark for a second and reappear with the area surrounded by the RESET pixels filled by the original paper colour. To leave UNPAINT mode you

Press CAPS SHIFT and BREAK

5.12 Inverting colours and shapes (INVERSE, CLEAR, FLIP LEFT/ RIGHT, FLIP UP/DOWN)

This is a particularly powerful set of facilities which you must use with care if you are to achieve the desired result. You can use the INVERSE and CLEAR functions to completely change the colours of the whole screen, and the FLIP functions to move pictures around the screen. The effect of all these functions depends on the control option in use when you chose the function. The result is shown in the table below:

Function	Effect to SCREEN	Effect to ATTRIBUTE
INVERSE	All pixels are reversed i.e. Set pixels become reset. Reset pixels become set.	Ink colours become paper colour. Paper becomes ink colour.
CLEAR	All pixels are reset. This destroys any picture you have drawn.	For **all** character positions the colours are changed to the current INK and PAPER colours.
FLIP UP/ DOWN	This turns the SCREEN upside down.	This turns the attributes upside down.
FLIP LEFT/ RIGHT	This flips the SCREEN from LEFT to RIGHT.	This flips the attributes from LEFT to RIGHT.

If your control option is SCREEN and you use one of the above functions, the ATTRIBUTES are unchanged.

If your control option is ATTRIBUTES, the SCREEN details are unchanged.

If your control option is ATTR & SCR, the above functions effect both the SCREEN and the ATTRIBUTES. However, with this control option, the INVERSE option will have no effect.

To choose INVERSE press C
To choose CLEAR press CAPS SHIFT and C
To FLIP LEFT/RIGHT press X
To FLIP UP/DOWN press CAPS SHIFT and X

5.13 Scrolling (SYMBOL SHIFT and ARROWS)

The scrolling option allows you to move either the SCREEN details or the ATTRIBUTES or both (depending on the current control option), to the right, to the left, up or down.

The effect of scrolling with the different control options is shown in the table below:

Control option	Effect on SCREEN	Effect on ATTRIBUTES
ATTR	None	Scroll Attribute cells
SCREEN	Scroll screen one pixel (very fine scroll)	None
ATTR & SCR	Scroll screen 8 pixels	Scroll attributes one square (i.e. 8 pixels)

Note: All scrolls wraparound. This means that anything you scroll off the top of the picture will reappear at the bottom, and anything scrolled off one side of the picture will reappear on the other side.

To scroll in a particular direction, press SCROLL SHIFT and the relevant cursor arrow key. To continue scrolling continue pressing the keys.

6.0 Loading and Saving

The facilities described in Chapters 4 and 5 are part of the drawing option. This is the first option shown on the main menu when the GRAFPAD program is loaded. However, the GRAFPAD also allows you to save pictures and UDGs back to screen or in a BASIC program. With these facilities you can save pictures and complete or correct them later, or save UDGs which can later be included in another picture. When you save or load UDGs, the complete set of UDGs (a to u) are saved or loaded, even if some of the UDGs are empty.

This chapter gives the full load and save instructions for pictures and UDGs and also tells you how to save and load the GRAFPAD program itself to and from microdrive. These facilities are options 1 to 9 on the main menu, so to choose one of these options you must first return to the main menu.

To return to the main menu:

Press CAPS SHIFT and BREAK.

If you are in text mode, graphic mode or UDG mode you will need to do this twice. The first time takes you out of the mode and the second time takes you back to the menu. When the menu is on the screen, type the number of the option you want.

6.1 Saving and Loading Pictures

To Save SCREEN$ to tape:

choose option 2 from the menu.

To Save SCREEN$ to microdrive:

choose option 6 and supply a name for your picture in response to the prompt.

To Load SCREEN$ from tape:

choose option 1.

To Load SCREEN$ from microdrive:

choose option 5 and enter the name you have given the picture you want to load.

You can also load a screen from tape or microdrive into a BASIC program. The instruction is:

From tape:

LOAD " " SCREEN$

From microdrive:

LOAD * "m";1; "name" SCREEN$

(where 1 is the number of the microdrive, and name is the name you have given the picture on the microdrive).

Press ENTER.

6.2 Saving and Loading UDGs

To Save UDGs to tape:

choose option 4 from the menu.

To Save UDGs to microdrive:

choose option 8 and supply a file name for all UDGs (a to u) in response to the prompt.

To Load UDGs from tape:

choose option 3.

To Load UDGs from microdrive:

choose option 7 and enter the file name for the set of UDGs you want to load.

You can also load a set of UDGs for tape or microdrive into a BASIC program. The instruction is:

From tape:

LOAD " " CODE USR "a"
(where a is the UDG you require)

From microdrive:

LOAD * "m";1; "UD" CODE USR "a"
(where 1 is the number of the microdrive, UD is the name you have given the set of UDGs on microdrive, and "a" is the particular UDG you want to load).
Press ENTER.

Note: In loading a UDG the lower case "a" is a fixed value and not UDG name as in saving above.

6.3 Saving and Loading the GRAFPAD program

To Save GRAFPAD program to microdrive:

choose option 9 from the menu.

You can load the GRAFPAD program from BASIC by entering the instruction:

LOAD * "m";1; "GRAFPAD"
(where 1 is the number of the microdrive).
Press ENTER. SUBMIT DS.